CLAIMS

1. Method of analysis of ions by radial or axial mass-to-charge-selective ejection of ions from an rf quadrupole ion trap consisting of four pole rods, the field having freqency Ω, wherein the ejection of ions is supported by nonlinear resonances set up by superposition of higher multipole fields.

2. Method according to Claim 1 wherein the nonlinear resonance is produced by a superposition of higher "odd" multipole fields, and wherein the nonlinear resonance at Ω/3 is used for ejection.

3. Method according to Claim 2 wherein higher "even" multipole fields are superimposed simultaneously.

4. Method according to Claim 1 wherein the higher multipole fields are produced mechanically by a dislocated arrangement or unsymmetric shaping of the parallel pole rods.

5. Method according to Claim 1 wherein the higher "odd" multipole fields are produced by unequal amplitudes of the driving voltage at opposing pole rods.

6. Method according to Claim 5 wherein the ratio of the driving voltage amplitudes at opposing pole rods are adjusted to the scanning rate.

7. Method according to Claim 1 wherein the higher multipole fields are produced by a dislocated arrangement of the pole rods and by unequal amplitudes of the driving voltage at opposing pole rods.

8. Method according to Claims 1 wherein the ions are brought into nonlinear resonance by a dipolar excitation field.

9. Method according to Claim 8 wherein the dipolar excitation field is at the same frequency as the nonlinear resonance.

10. Method according to Claim 9 wherein the phase of the dipolar excitation field is locked to the phase of the frequency of the driving radio frequency voltage, and wherein the phases are adjustable in relation to one another.

11. Method according to Claim 1 wherein the ions are ejected radially through a slit in one of the pole rods.

12. Method according to Claim 1 wherein the ions are ejected axially through at least one apertured diaphragm at the end of the rod system.

13. Method according to Claim 12 wherein a dipolar excitation field is produced by splitting an apertured diaphragm on the front of the rod system and connecting one phase each of the excitation voltage to each half of the diaphragm.